CLAIMS:

Sub A1

1. A method of investigating radioactive sources in a body of material provided at an investigation location, the body of material comprising a plurality of samples, the method comprising detecting a portion of the emissions arising from a sample, the detected portion relating to a detected level, the detected level being corrected according to a correction method to give a corrected level, the method being repeated for one or more of the other samples, the correction method for one or more of the samples comprising providing a generator of radioactive emissions and detecting the radioactive emissions from the generator with the sample at the investigating location, the relationship of the emissions detected with the sample at the investigating location to the emissions which would be detected with the sample absent from the investigating location determining a characteristic of the sample, the determined characteristic being employed as a factor in the correction method used for that sample to obtain the corrected level.

2. A method according to claim 1 in which the relationship of the emissions detected with the sample at the investigating location to the emissions which would be detected with the sample absent the investigating location is the ratio of the respective count rates for the detectors.

3. A method according to claim 1 or claim 2 in which the relationship equates to $-\ln(R/R_o)$, where R is the rate at which the emissions are detected with the sample in place and R_o is the rate of emissions which would be detected without the sample in place.

4. A method according to any preceding claim in which the characteristic determined is a function of the density of the sample.

5. A method according to any preceding claim in which the characteristic is a function of the effective amount of material in the sample relative to one or more other samples.

6. A method according to any preceding claim in which the determination of the characteristic is based on the equation:-

$$R = R_o \exp(-\mu\rho x)$$

where where R is the rate at which the emissions are detected with the sample in place and R_o is the rate of emissions which would be detected without the sample in place; μ is the mass attenuation coefficient; x is the thickness of the sample (between source and detector); and ρ is the density of the sample.

7. A method according to claim 6 in which under the conditions of the investigation x and μ are substantially constant.

8. A method according to claim 6 or claim 7 in which x is kept constant by fixed relative generator, detector and sample positions.

9. A method according to any of claims 6 to 8 in which μ is substantially constant due to the energy of the generator emissions.

10. A method according to any preceding claim in which the characteristic is a function of the effective amount of

material in a sample and the amount of material in a sample is a function of the effect on transmission of generator emissions by that sample, the total amount of material being proportional to the effects of all the samples, the fraction of the total material in a particular sample being a function of that sample's effect on transmission to the sum of all the effects.

11. A method according to claim 10 in which the fraction of the total material in a particular sample is a ratio of that sample's effect on the transmission to the sum of all the effects of the samples on the transmission.

12. A method according to claim 10 or claim 11 in which the amount of material in a sample, Vs, equates to :- $-\ln(R/R_o)$.

13. A method according to claim 12 in which the total amount of material in the body of material is proportional to the sum of each sample amount, $\sum Vs$.

14. A method according to claim 12 or claim 13 in which the fraction of the body of material in a given sample is $Vs/\sum Vs$.

15. A method according to any preceding claim in which the characteristic is determined based on a number of variables including one or more of, and ideally all of, :-

I) the total mass of the body of material, M;

ii) the total volume of the body of material, V;

iii) the total number of samples forming the body of material, N;

iv) the amount of material in a given sample, Vs;

v) the sum of all the values proportional to the amounts of material in the sample volumes, $\sum Vs$;

vi) the density of the sample.

16. A method according to any preceding claim where the characteristic is determined based on the equation :-

$$\rho = (N.M/V) \cdot (Vs/\sum Vs)$$

17. Apparatus for investigating radioactive sources in a body of material, the body of material comprising a plurality of samples, the apparatus comprising:

one or more detectors for emissions from the sources, the detectors generating signals indicative of the emissions detected;

an investigating location into which the sample is introduced;

signal processing means for relating the detector signals to a detected level for the sources;

processing means providing a correction method for correcting the detected level for the sources to give a corrected level;

the apparatus further comprising:

a generator of radioactive emissions, at least of portion of the emissions entering the investigating location and, in use the sample;

one or more detectors for detecting the generator emissions with the sample at the investigating location;

processing means for determining a characteristic of the sample based on the relationship of emissions detected with the sample at the investigating location to emissions which would be detected with the sample absent, the characteristic being employed by the processing means as a factor in the correction method used for that sample to obtain the corrected level.